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AUTHOR Beal, Jack
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ABSTRACT

This survey of remedial or developmental mathematics programs is based on useable responses from 98 community-junior colleges during the fall and winter of 1969. Of the 185 schools originally contacted, 42 specifically indicated no such program, and only six questioned their appropriateness. The most often indicated reasons for the existance of remedial programs were to enable students to continue in regular college math, or to satisfy prerequisite requirements for some other non-mathematics courses. Basic algebra, intermediate algebra, arithmetic, and Euclidean geometry were the courses most frequently offered. In selecting students for remedial programs, standardized tests, previous grades, and counselor recommendation were the most often used criteria. Enrollment in remedial courses included at least 20 per cent of all mathematics students at 51 of the schools. Enrollment in subsequent math courses by continuing students reached an average per cent of 39.4 in 51 of the colleges. Entrance into these non-remedial courses was based largely on grades of C or D in the remedial course. More than half the faculty in each school was involved in the programs, and the major bases for selection included rotation, interest, and understanding of the underachiever. Only 26 of the respondents indicated efforts to evaluate their program. (JO)

Research Report

An Analysis of Remedial Mathematics Programs in Junior and Community Colleges

by

Jack Real

Graduate Assistant

University of Nebraska

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TABLE OF CONTENTS

Introduction

According to G. Robert Barnes, "One of the unusual and distinctive features of the comprehensive junior college is its willingness and ability to provide both facilities and instruction for varied subject matter for students with a wide range of academic ability as well as social and economic background."

Describing one college's offering of remedial courses, Burton R. Clark in The Open Door College states: "As a cutting score for placement in remedial mathematics and English classes, the college used the score of 9.4. On this basis 20 to 30 percent of the applicants fell in the remedial category on five of the six sections of the achievement test."

Interest in whether the community college is providing a program of remedial mathematics led this writer in the fall, 1969, to determine the availability of such remedial programs. For the purpose of this report, junior colleges whether classified as comprehensive or not, will be referred to as community colleges. No attempt was made to differentiate between public or private two year schools. The only criteria for selection was that the school be listed in the 1968 Directory American Association of Junior Colleges.

Problem

The major problem in this study was proposed as follows: are effective remedial mathematics programs being offered by the community college?

Supplemental questions this investigation sought to answer were:

1. What mathematics courses are offered through the remedial program?
2. Are students required to enroll in remedial mathematics programs?
3. What criteria is used for selection of remedial mathematics students?
4. What criteria is used for the selection of the remedial mathematics instructors?
5. What are the most common instructional techniques used in teaching a remedial mathematics course?

Procedures

A letter (Appendix C) was mailed to a total of 185 schools selected by choosing every fifth school as listed in the 1968 Directory American Association of Junior Colleges. The president of the institution was requested to indicate whether a remedial mathematics program was offered, and the person(s) who could offer

the most pertinent data about that program. If no program was offered, the president was asked to complete a short questionnaire (Appendix A) requesting the reason for not offering such a program. Of the 185 schools receiving the original letter, 125 replied they had programs, 42 replied no program was offered, and 18 did not reply.

A questionnaire (Appendix B) was mailed to each of the 125 schools that answered affirmatively to the first letter. Of these, 100 questionnaires were returned; however two of the 125 affirmative answers to the original letter replied on the final questionnaire that no program was offered. Thus a total of 98 completed questionnaires could be used in the final summary.

Findings

Of the 42 schools that indicated they had no remedial program in mathematics, 19 were private and 23 were public. All enrolled fewer than 4,000 students, the average being approximately 500 students.

Table I gives the frequency with which reasons were given for not offering a remedial program.

Table I

Reason Given for Not Offering Remedial Mathematics Programs by Number of Colleges Mentioning

Reason	#Number of Colleges
Offered by another agency.	6
Staff not available.	11
Need for courses not established.	19
Not appropriate.	6
Others.	6

N = 42

#Frequency does not total 42 since some of the colleges listed more than one reason for not offering a program.

Under "Others" such reasons as other colleges in the area, funds, space, and offered during the summer school were mentioned. Also, it should be noted that only six colleges did not feel that remedial courses were appropriate for their curriculum.

The remainder of the findings pertain to the 98 colleges that replied to the questionnaire concerning their remedial mathematics program. Table II indicates the distribution of reasons given for offering a remedial program in mathematics.

Table II

Purpose for Offering the Remedial Mathematics Programs by Number of Colleges Mentioning

Purpose	#Number of Colleges
To enable students to continue in regular college mathematics.	83
To satisfy high school equivalence or diploma requirement.	23
To satisfy prerequisite requirement for some college course other than in mathematics.	52
To satisfy technical vocational requirement.	7

N = 98

#Again the total does not equal 98 since some colleges checked more than one reason.

The specific type of remedial math courses and the frequency of occurrence can be found in Table III. Algebra I and intermediate algebra appear as the most popular courses. The writer exercised some liberty in assigning responses to the last three courses as listed in the table. For example, in some of the responses business mathematics was referred to as business arithmetic or basic mathematics was referred to as refresher mathematics.

Table III

Courses Offered Through Remedial Mathematics Programs with Indicated Frequency

Course	#Frequency
Algebra	73
Euclidean Geometry (Plane and Solid)	29
Intermediate Algebra	60
Arithmetic	45
Trigonometry	9
Technical Mathematics	5
Business Mathematics	4
Basic Mathematics	5

N = 98

#Totals greater than 98 occur due to colleges offering more than one course.

Of the schools responding, 49 indicated that their school required students to enroll in remedial work, whereas 44 did not. Five did not respond to the question. Of the 49 institutions where remedial courses were mandated, Table IV lists the frequency with which different methods were used to select students for the remedial mathematics program.

Table IV

Selection Criteria for the Remedial Mathematics Program by Number of Colleges Mentioning

Method	#Number of Colleges
Standardized tests##	33
Teacher constructed tests	10
Counselor recommendation	23
Previous grades	26
Other	8

N = 49

#Totals greater than 49 occur due to colleges using more than one selection criteria.

##The most frequently mentioned of the standardized tests used were ACT, DAT, ETS, CCOP Math, and SCAT.

As an indicator of the need for remedial mathematics classes and in support of the findings in the book, The Open Door College, Table V lists the approximate percentages of total enrollments in mathematics courses in the sampled schools who take remedial mathematics. Over one-half of the schools responding indicated 20 percent or more of their mathematics students enrolled in remedial classes.

Table V

Enrollment in Remedial Mathematics as Compared to Total Enrollment in Mathematics

Percentage in Remedial Mathematics	Frequency Mentioned
20 percent or above	51
10 to 19 percent	23
five to nine percent	14
zero to four percent	10
N = 98	

As a criterion for measuring the success of the remedial program, the rate with which students enrolled in subsequent mathematics courses was requested. Table VI gives a summary of the responses. The reader will note that 51 colleges indicated an average of 39.4 percent of the remedial students subsequently enrolled in a mathematics course not in the remedial program. Also 38 colleges reported 44.6 percent of the remedial students did not enroll in any subsequent mathematics course.

Table VI

Enrollment of Remedial Mathematics Students in Subsequent Mathematics Courses by Percent Continuing

Subsequent Enrollment	#Number of Schools Responding	##Average of Percent Reported
Another remedial math course	26	15.0
A math course not in the remedial program	51	39.4
Not enrolled in any mathematics course	38	44.6
A nonmathematics course that required the student to have completed a remedial mathematics course	14	18.9

#Totals exceed 98 since schools responded to more than one category.

##Totals exceed 100 since schools responed to more than one category.

Respondents were asked to identify the requirements for enrolling in a second remedial mathematics course or for taking a mathematics course not in the remedial program after having completed an initial remedial course. Table VII summarized these results. These results would seem to indicate the responding schools were very realistic in their requirements for continued enrollment in mathematics. This becomes apparent when one notices that no school requires a grade of better than a C for

subsequent enrollment in a remedial mathematics course and only one school required a grade of better than C for enrollment in a subsequent nonremedial mathematics course.

Table VII

Minimum Requirement for Enrollment in Subsequent Mathematics Course

Remedial Mathematics Course		Nonremedial Mathematics Course	
Requirement	Number of Schools	Requirement	Number of Schools
None	5	None	7
Pass	3	Pass	7
Recommendation of Instructor	1	Recommendation of Instructor	4
Grade of 60%	1	Grade of 60%	3
Grade of C	20	Grade of 45%	1
Grade of D	18	Grade of 80%	1
		Grade Satisfactory	2
		Grade of C	41
		Grade of D	25
		Grade of B	1

N = 98 Not all schools responded to this question.

Of the 91 colleges reporting, it was learned that an average of 54.7% of the mathematics faculty was in some way involved in the remedial program. The rationale used in the selection of instructors for the remedial program is shown in Table VIII. The responses reflected the opinion of the person completing the questionnaire and not necessarily the college. As might be expected, the most frequent method of selection was by a random or rotation basis even though it would seem great care should be exercised in the selection of teachers for remedial classes. It should be noted, however, that 19 colleges selected staff members who showed interest in the remedial program. Also 19 colleges selected staff members who understand the underachiever.

Table VIII

Selection of Staff for Remedial Programs

Rationale	Number of Colleges
Random or rotation basis	31
Someone that shows interest	19
Knowledge of high school curriculum or experience in the high school	6
Understands the underachiever	19
Innovator	2
Specialist with slow learners	2
Instructor with least seniority	1
Only one mathematics instructor	1
Broad background in other fields as well as mathematics	2
Ability to work well in individualized programs	1
One with smallest teaching load	1

Authorities suggest the strategy used in teaching remedial mathematics courses should differ from the usual lecture course found in college mathematics; thus an attempt was made to determine the most common type of strategy employed. Table IX summarizes the results of this query. It was notably discouraging to note that 85 schools reported an average of 40% of class time

devoted to lecturing. On the other hand it was encouraging to find 83 schools averaging 35% of the class time in discussion. Also of note was the fact that some schools were using individualized methods to better provide for the remedial student. Some of the other techniques mentioned but not included in the Table were chalkboard, 50%; workshop, 34%; and quiz/test, 20% to 80%.

Table IX

Techniques Used in Teaching Remedial Mathematics Courses

Technique	Number of Schools Mentioning	Average Percentage of Total
Lecture	85	40.0%
Discussion	83	35.1%
Individualized Instruction	67	24.2%
Programmed Texts	30	35.1%
Teaching Machines	6	12.8%

Summary of Findings

This study was begun in the fall of 1969 and concluded in the spring, 1970. One hundred eighty five schools were

selected from the 1968 Directory American Association of Junior Colleges. Of these 125 indicated they had special programs for students deficient in mathematical background. Ninty-eight colleges completed a final questionnaire relative to their remedial mathematics program.

Forty-two of the 185 colleges initially contacted offered no remedial mathematics program. However, only six of the 42 colleges gave as a reason, "not appropriate for their curriculum." As commonly expected, the most frequent reason given for offering a program was to enable students to continue in a regular mathematics program. The courses most frequently offered in the remedial program were algebra and intermediate algebra. Only 49 of the 98 colleges required students to take remedial work in mathematics. In support of the findings in the book, The Open Door College, 51 colleges reported 20% or more of their current mathematics enrollment was in the remedial program. Approximately one-third of the colleges indicated an average of 44% of the students who last year were enrolled in a remedial mathematics course, did not enroll in a subsequent course. This failure to enroll in subsequent mathematics courses was not due to selective requirements since 66 schools required only a C or D in a remedial class as prerequisite for enrollment in a regular mathematics class. The most common method of selecting instructors for the remedial

classes was by a random or rotation basis. These instructors used the lecture-discussion method of instruction more than any other method. Finally, only 26 colleges had made an attempt to evaluate the effectiveness of their programs.

Conclusions

Within the limitations of this study, one basic conclusion can be drawn: community colleges do provide experiences whereby students with deficiencies in mathematics can be assisted in gaining the background skills needed to enroll in the regular college credit mathematics courses.

No concerted attempts have been made by more than a few community colleges to determine the effectiveness of these programs. It remains questionable whether the programs have been very successful in attaining their stated goals--that of providing a program designed to assist students in removing these deficiencies.

Implications

Implications for future study are indicated. The inclusion of remedial work in mathematics would be justified

since only six of 167 colleges felt it was not appropriate. Also 51 of the 92 colleges responding to the questionnaire reported 20% or more of the mathematics students in some remedial work.

Special training for the instructor would be helpful and an interest in this type of student imperative. One instructor's response seemed particularly appropriate, "The instructor should understand the open door policy."

Of interest to the writer was the lecture-discussion as the dominant form of teaching. Since these students, for various reasons, have not experienced success in mathematics, every effort should be made to structure the course to facilitate the individual student. There are many attempts to provide for individual differences, other than lecture. Possibly more effort should be expended by mathematics departments of community colleges to devise strategies other than lecture to provide for the remedial student.

Community colleges have the potential to provide a program for the student with a deficient background in mathematics. This study indicates the degree to which we are successfully providing such a program. As long as we continue to have the philosophy of the "open door" in the community college, we must continually strive to meet the needs of all students through special programs of study.

Bibliography

1. Clark, Burton R., The Open Door College, McGraw-Hill Book Company Inc., New York, Toronto, London, 1960, p. 51.

2. Darnes, G. Robert, "The Science and Mathematics Curricula in the Junior College," School Science and Mathematics Journal 68:609-18.

Appendix A

If a remedial mathematics program is offered, please list the name or names of persons with whom we may communicate for information relative to this program.

Name Title or Position

If no remedial mathematics program is offered, check as many responses as are appropriate.

_____ (1) Offered by other agency. Specify: _____

_____ (2) Staff not available.

_____ (3) Need for courses not established.

_____ (4) Not appropriate.

_____ (5) Others. List any additional reasons for not offering a remedial program.

(a) _____

(b) _____

(c) _____

Signature _____

Institution _____

State _____

Zip Code _____

Appendix B

A Survey of Remedial Mathematic Programs

1. Check the purpose or purposes for offering a remedial mathematics program at your school.

_____ (1) Continue in regular college mathematics
_____ (2) Satisfy high school equivalence or diploma requirement.
_____ (3) Satisfy prerequisite requirement for some college course other than in mathematics.
_____ (4) _____

2. How many members of the mathematics faculty are involved in teaching the remedial program? _____
This represents _____per cent of the total math faculty.

3. Check the courses offered under the remedial mathematics program.

_____ (1) Algebra I
_____ (2) Euclidean Geometry (Plane and Solid)
_____ (3) Intermediate Algebra
_____ (4) Arithmetic
_____ (5) Other (Specify)
_____ (6) Other (Specify)
_____ (7) Other (Specify)

4. Are students required to take any or all of the above courses?
_____ yes, _____ no. If yes, check the methods used to select these students. If minimum scores are required, what are these scores?

		Minimum scores
_____	(1) Standardized test	(1)_____
Title of test _____		
_____	(2) Teacher constructed test	(2)_____
_____	(3) Counselor recommendation	
_____	(4) Previous Grades	(4)_____
_____	(5) By a formula using any of the above information.	
Specify formula_____		(5)_____
_____	(6) Other (Specify)	

5. Indicate the approximate percentage of students enrolled in all mathematics courses that are taking remedial mathematics.

_____ 20 percent or above
_____ 10 to 19 percent
_____ five to nine percent
_____ zero to four percent

6. If available, what is the approximate percentage of students who last year were enrolled in the remedial math program and are currently: percentage

_____ (1) enrolled in another remedial math course.
_____ (2) enrolled in a math course not in the remedial program.
_____ (3) not enrolled in any mathematics course.
_____ (4) enrolled in a non pathematics course that required the student to have completed a remedial mathematics course.

Appendix B

7. If a student completes a remedial mathematics course he may:
_____ (1) take another remedial mathematics course if he received at least a grade of _____.
_____ (2) take a mathematics course not in the remedial program for which he satisfies the prerequisites if he receives at least a grade of _____.

8. For each of the following teaching techniques indicate the approximate percent of total time that is used in teaching the remedial classes.
_____ (1) Lecture
_____ (2) Discussion
_____ (3) Individualized Instruction
_____ (4) Programmed Texts
_____ (5) Teaching machines
_____ (6) Other (Specify)
100 percent Total

9. Please list below your teaching assignment.

Course Title	Number of hours of credit for each
(1)_____	(1)_____
(2)_____	(2)_____
(3)_____	(3)_____
(4)_____	(4)_____

10. In your opinion, what is the rationale used to select the instructors for the remedial mathematics courses?

11. Is college credit given for remedial courses? _____no.
_____yes. If yes, does the credit apply towards a degree?
_____yes, _____no.

12. Have you conducted any evaluation concerning the effectiveness of your remedial mathematics program?

_____no. _____yes. How recent?_____
If a summary is available, please enclose with the questionnaire.

Again, thank you for completing the questionnaire. If any copies of course syllabi are available, would you please send them to me with this questionnaire or under separate cover. These will not be used in the final report, but would be valuable references for future designs of programs of this nature. Also, if you would like a copy of the report when it is completed, please check. _____

Signature_____
Institution_____
City_____
State_____
Zip code_____

THE UNIVERSITY OF NEBRASKA
LINCOLN, NEBRASKA 68508

TEACHERS COLLEGE
DEPARTMENT OF
SECONDARY EDUCATION

November 28, 1969

Dear

The University of Nebraska is conducting a survey of programs of remedial or developmental mathematics offered by community colleges. For purposes of this study, remedial or developmental mathematics courses are defined as follows: intermediate algebra I, geometry, algebra II, consumer or business math, and trigonometry. The often found course which includes college algebra/trigonometry, calculus/ analytical geometry is not considered normal high school offering.

If your college offers such courses, please indicate on the enclosed form the name or names of persons with whom we might correspond in order to obtain information relative to these courses. This information will be collected by a questionnaire that will include items such as courses offered under the remedial program, textbooks used in the courses, selection of students for the program, teaching techniques used in the courses, and goals of the remedial program. If such courses are not offered, please indicate in the appropriate space on the enclosed form.

Sincerely yours,

Udo Jansen
Associate Professor